QuadTech

Formerly GenRad Instruments

Sentry Hipot Tester
Instruction Manual

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©QuadTech, Inc., 1996

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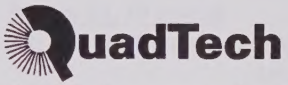
Warranty



QuadTech warrants that Products are free from defects in material and workmanship and, when properly used, will perform in accordance with QuadTech's applicable published specifications. If within one (1) year after original shipment it is found not to meet this standard, it will be repaired, or at the option of QuadTech, replaced at no charge when returned to a QuadTech service facility.

Changes in the Product not approved by QuadTech shall void this warranty.

QuadTech shall not be liable for any indirect, special or consequential damages, even if notice has been given of the possibility of such damages.

This warranty is in lieu of all other warranties, expressed or implied, including, but not limited to any implied warranty or merchantability or fitness for a particular purpose.

SERVICE POLICY

QuadTech policy is to maintain product repair capability for a period of five (5) years after original shipment and to make this capability available at the then prevailing schedule of charges.

Specifications

Sentry 10, 20 and 30

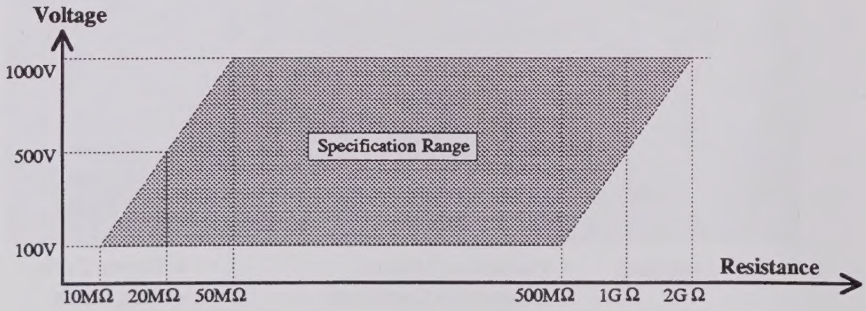
AC Output Voltage: Range: 0.1 to 5KV AC, in 10V/steps, 50/60 Hz
Accuracy Display: +/-1% of reading + 5V
Regulation: ≤1% +5V

Sentry 20 and 30 Only

DC Output Voltage: Range: 0.1 to 6KV DC, in 10V/steps
Accuracy Display: +/-1% of reading + 5V
Regulation: ≤1% +5V

Sentry 30 Only

Insulation Resistance:	Range:	10MΩ - 10GΩ
	Accuracy:	+/-10% of reading + 10 cts, ≥500V, <2GΩ
		+/-15% of reading + 10 cts, <500V, <2GΩ
		Decreased accuracy, >2GΩ
	Voltage:	50 - 1000V DC in 1V steps
	Accuracy:	+/-(5% of setting + 5V)
	Limit:	High/Low
	Test Time:	0.1 - 999sec (+/-20ms)



Specifications (continued)

Features Standard On All Sentry Units

Leakage Current:
Range:
- 0.001 to 15mA AC
- 0.001 to 7.5mA DC

Accuracy: +/-(1.5% + 5 counts)

Breakdown:
Detection:
- Imax: 0.001 to 15mA AC, 7.5mA DC
- Accuracy: +/-(1% of limit + 50μA)
- ΔI: 10μsec, 0.001 to 15mA

Indication: Pass/fail light, audible sound

Min Threshold:
0.001mA to Imax limit
0.001mA to 7.5mA DC Check Lo (in-rush current)

Test Time:
Ramp: 0.1 to 99.9sec (+/-20ms)
Hold: 0.1 to 999sec (+/-20ms)

Remote Control:
Remote Start, Stop, Pass/Fail Output, Interlock

Continuity Check:
Current: 0.1A AC
Max Gnd Resistance: 1Ω +/-0.1Ω

Mechanical:
Bench Mount with Carry Handle
Dimensions: (w x h x d):11x4x14in (270x100x350mm)
Weight: 21 lbs (10kg) net, 28 lbs (13kg) shipping

Environmental:
Meets MIL-T-28800E, Type 3, Class 5
Operating: 0 to + 40° C
Humidity: <75%
Storage: - 10 to + 60° C

Power:
- 90 - 130V AC
- 200 - 250V AC
- 50 or 60Hz
- 300W max

Supplied:
- Instruction Manual
- Calibration Certificate
- Power Cable
- Test Leads

Ordering Information:

Description	Catalog Number
Sentry 10 AC Hipot Tester	Sentry 10
Sentry 20 AC/DC Hipot Tester	Sentry 20
Sentry 30 AC/DC/IR Hipot Tester	Sentry 30

Section 1 Introduction

1.1 Product Overview

The Sentry is available in three models, all of which provide AC Hipot testing capability. Additionally, the Sentry 20 provides DC Hipot testing, and the Sentry 30 provides DC Hipot testing and Insulation Resistance testing. The hipot test can be programmed over a voltage range of 0.1 to 5KV AC and 0.1 to 6KV DC with a min/max leakage current detection range of 10μA to 15mA AC and 7.5mA DC. Insulation resistance measurements are possible to 10GΩ at programmable DC test voltages between 50 and 1000V. Each instrument comes standard with ground continuity check, internal storage of 10 test setups, and interface with remote start/stop inputs and pass/fail outputs.

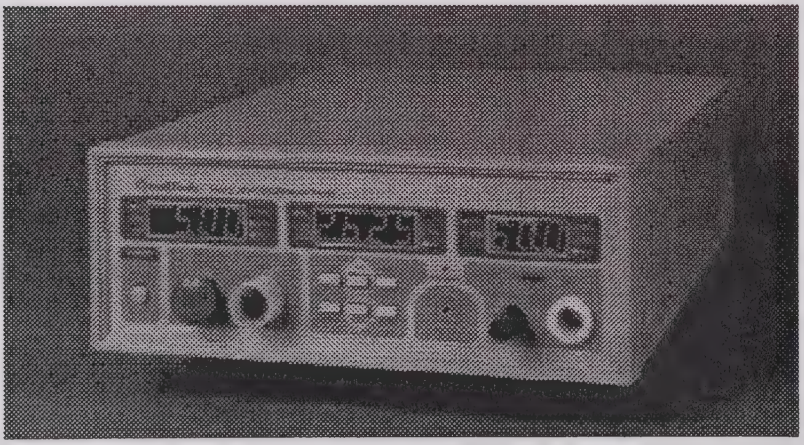


Figure 1-1
Sentry Hipot Tester

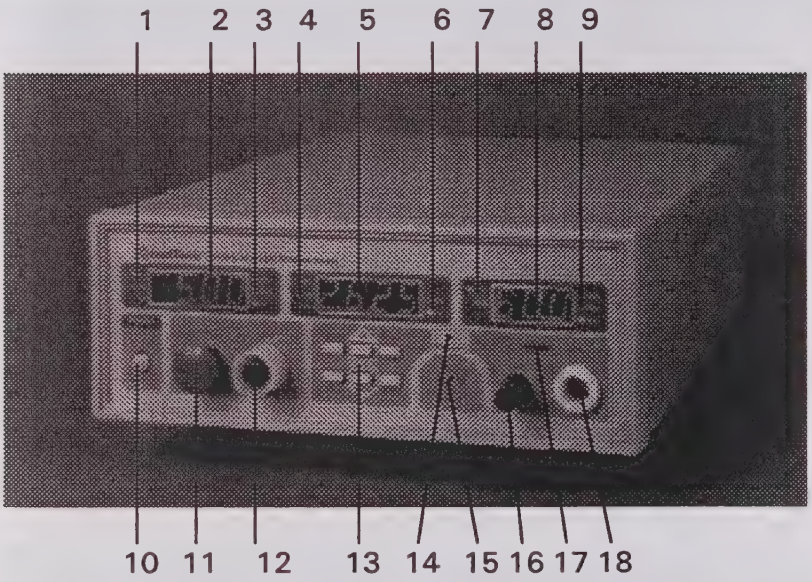


Figure 1-2
Front Panel Controls

Table 1-1
Front Panel Controls and Indicators

Fig 1-2 Ref. No.	Item	Function
1	Mode AC/DC/IR	Light indicates that tester is in AC Hipot, DC Hipot or Insulation Resistance mode status. (DC for the Sentry 20 & DC/IR for the Sentry 30).
2	Voltage Display	Display shows voltage setting value when test is not in process and shows output voltage when test is in process. 0.1-5KV for AC, 0.1-6KV for DC and 0.05-1KV DC for IR
3	Output Freq LED's	Indicates output frequency (50 or 60Hz) when an AC Hipot test is selected.

Table 1-1 (continued)
Front Panel Controls and Indicators

Fig 1-2 Ref. No.	Item	Function
4	Limit Indicator	Indicates the function of the limit shown on the Limit Display (Hi, Lo or ARC)
5	Limit/Measure Display	Display shows limit setting when test is not in process and shows testing value when test is in process. **AC Hipot -** Hi (0 - 15mA) Lo (0 - 7.5mA) ARC (0.5 - 15mA) **DC Hipot -** Hi (0 - 7.5mA) Lo (0 - 3.75mA) ARC (0.5 - 15mA) **Insulation R** Hi (1 - 9999 MΩ) Lo (1 - 9999 MΩ)
6	Display Units	Indicates the units for the limit display (mA for AC or DC Hipot & MΩ for IR).
7	Timer Indicator	Indicates the timer display (test or ramp time)
8	Timer Display	Display shows the time countdown. Ramp is the rising time of the voltage (0 - 99.9sec) and test is the measure time (0 - 999sec). A test time of 0 (zero) places the instrument in a continuous measure mode.
9	Pass/Fail	Indicates a pass or fail of the test based on the entered limits.
10	Power Switch	Applies AC power to the tester (depressed is ON)
11	STOP Button	Pressing this button stops a test in process and must be pressed as a reset function before a test can be started (after a failed test or after test conditions have been reprogrammed).
12	START Button	Pressing this button starts a test and applies high voltage to the test terminals.

Table 1-1 (continued)
Front Panel Controls and Indicators

Fig 1-2 Ref. No.	Item	Function
13	Data Entry Keys	6 keys for entering test conditions. **PROG** - Press to enter test condition change mode, and press again to exit test condition change mode. **ENTER** - Press to confirm the entered test condition. ▲ & ▼ - UP/DOWN arrow key selects step 1 or step 2 with instrument in standby status (Refer to programming Test Mode). When programming test conditions UP/DOWN arrow key increases or decreases the selected parameter (voltage, limits or time). **STORE** - Press to initiate storage of 1 of 10 possible setups. **RECALL** - Press to initiate recall of 1 of 10 possible setups.
14	Cal Enable	For use by a qualified service personnel during instrument calibration.
15	Buzzer	Audible output to indicate test complete. Remains on until STOP depressed on fail condition.
16	GND	Low potential terminal for high voltage output.
17	Test Status Indicator	When indicator light is blinking high voltage is present on the output terminals.
18	H.V. OUT	High potential terminal for high voltage output.

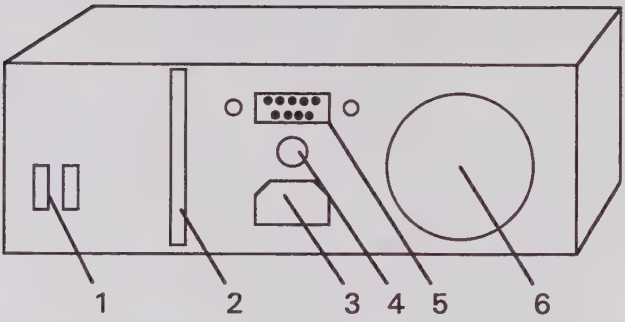


Figure 1-3
Rear Panel Control/Connectors

Table 1-2
Rear Panel Connectors and Controls

Fig 1-3 Ref. No.	Item	Function
1	Voltage Selector	Switches for selecting range of AC power source - Set to 100V position for 90 - 100VAC operation - Set to 120V position for 110 - 130VAC operation - Set to 220V position for 200 - 240VAC operation - Set to 240V position for 220 - 250VAC operation
2	Remote	Remote control connections (terminals). Refer to paragraph 2.15.
3	AC Line	Connection for AC power source.
4	Cont Check	Connection for continuity check (banana).
5	Remote	Remote control connections (9 pin D-type). Refer to paragraph 2.15.
6	Fan	Temperature control fan. - on for > 50°C - off for < 50°C

1.3 Accessories Included

Table 1-3

Item	Quantity
Instruction Manual	1
Calibration Certificate	1
Power Cable	1
Power Line Fuse, 4A	2
SO2, Test Lead Set (1 black, 1 red, w/clips)	1
Continuity Check Clip Lead (white)	1

1.4 Accessories/Options Available

Table 1-4

Item	Part Number
HV Lead Set, high & low, 1m (std w/unit)	S02
Corded Product Adaptor, 115V	S03
HV Lead Set, high & low, 2m	S04
Foot Switch	S05
High Voltage Probe	S06
Power Entry Adaptor Cable	S07
Gun Probe	S08
HV Lead, 1 meter, unterminated	S09
HV Lead, 2 meters, unterminated	S10
Gun Probe with remote start	S11
Load Box, resistive	S12
Load Box, custom resistors	S14
International Power Strip	G16

1.5 Power Requirements

The Sentry can be operated from a power source of 90 to 130 VAC or 200 to 250 VAC. Power connection is via the rear panel through a standard receptacle. Before connecting the 3-wire power cord between the unit and AC power source make sure the voltage selection switches on the rear panel (as indicated) are in accordance with the power source being used. 4A, 250V, 5x20mm, for 90-130V source and 2A, 250V, 5x20mm, for 200-250V source. Always use an outlet which has a properly connected protection ground.

To change the fuse proceed as follows:

WARNING

MAKE SURE THE UNIT HAS BEEN DISCONNECTED FROM ITS AC POWER SOURCE FOR AT LEAST FIVE MINUTES BEFORE PROCEEDING.

Remove the fuse drawer, by inserting a flat head screwdriver behind the small tab located just below the 3 prong receptacle, and force outward.

Once the fuse drawer has been removed from the instrument snap the fuse from the holder and replace. Make sure the new fuse is of the proper rating. Note that the fuse drawer can also be used to store a spare fuse.

Install the fuse drawer back in the inlet module (fuse down) by pushing in until it locks securely in place.

Section 2 Operation

2.1 Startup

Check to make sure the Voltage Selector Switch on the rear panel agrees with the power source available (Depending on the power source the switch positions should be in the up or down positions as shown).

WARNING

NEVER TOUCH THE TEST LEADS IN ANY MANNER (this includes insulation on all wires and clips) WHEN THE HIGH VOLTAGE IS APPLIED AND RED DANGER LIGHT ON

USE ALL PRECAUTIONS NECESSARY TO AVOID TOUCHING THE DEVICE UNDER TEST WHEN THE RED DANGER LIGHT IS ON OR BLINKING.

Before connecting the instrument to its power source the **interlock function** on the rear panel remote connector must be properly utilized. **This is an important safety feature for the protection of the operator.** Turn on of the instrument's high voltage is inhibited with no interlock connection and is functional with the interlock jumper in place (as shipped from the factory).

Connect the instrument power cord to the source of proper voltage. **The instrument is to be used only with three wire grounded outlets.**

Power is applied to the Sentry by pressing the POWER button on the front panel.

WARNING

DO NOT TURN INSTRUMENT POWER ON OR OFF WITH TEST DEVICES CONNECTED.

On power-up the unit indicates the model number on the measure display (S 10, S 20 or S 30) and is automatically set for those test conditions when the unit was last powered down.

2.2 Instrument Zeroing/Offset

The Sentry provides automatic zeroing/offset for lead or fixture effects. During the zeroing/offset process a correction is made (subtracted out) as the result of lead leakage current and stored in instrument memory to be applied to ongoing measurements. For maximum measurement accuracy it is recommended that the unit be zeroed after power-up and any time the test leads or fixture is changed. **The instrument should warm-up for at least 15 minutes before zeroing.**

Proceed as follows for automatic zeroing/offset:

- Plug the cable set (or other lead set/fixture) into the front panel GND and H.V. connectors.
- With the instrument in the power-up state, Press **ENTER** key twice.
- Press **UP** ▲ key once, display should read **OFSt** and **oFF**.
- Press **UP** ▲ or **DOWN** ▼ key to display **OFSt** and **GEt**.
- Push the **START** button to initiate the automatic storage of the offset value.
- The offset will remain **on** until turned off by pressing the **ENTER** key twice, the **UP** ▲ key once and the UP ▲ or **DOWN** ▼ key to **off.** If the instrument is powered down with the offset on it remains in effect when the unit is again powered up.

The following formulas apply to the offset function:

For AC offset current < 50μA:

$$\text{Display current} = \sqrt{(\text{current read})^2 - (\text{offset current})^2}$$

For DC offset or AC offset current ≥ 50μA:

Display current = (current read) - (offset current)

2.3 Connection to Device Under Test

Before connecting the device for test **Press the STOP key** and make sure the red DANGER light is not on.

Connect the black test cable to the front panel GND connector. The metal retaining bracket attached to this cable is intended to lock behind the connector and prevent this cable from accidentally coming loose, make sure this bracket is locked in place. Rotate the outer portion of the black connector counter clockwise (ccw) to loosen and rotate clockwise (cw) to lock the retaining bracket in place.

Plug the red test cable into the H.V. connector on the front panel.

Connect the black test cable (GND) to one side of the device under test and the red test cable (High Voltage) to the other side of the device under test.

WARNING

NEVER TOUCH THE RED AND BLACK TEST LEADS WHEN THEY ARE CONNECTED TO THE INSTRUMENT AND THE RED DANGER LIGHT IS ON OR BLINKING.

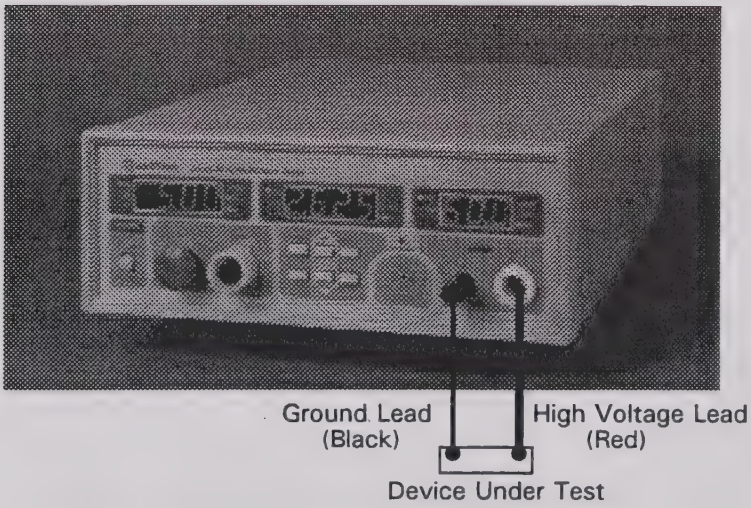


Figure 2-1
Device Under Test

2.4 Measurement Procedure

Once the instrument has been powered up, the offset function implemented and the device under test connected, testing can begin. The operator has the choice of performing a test at **power-up conditions** (test conditions at which the instrument was last powered down), or recalling one of 10 possible **stored setups.** Refer to paragraph 2.5, 2.6 or 2.7 for instructions to change the test mode and/or test conditions.

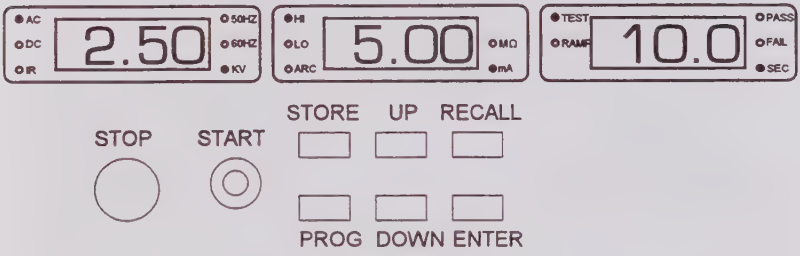


Figure 2-2
Instrument Control Keys

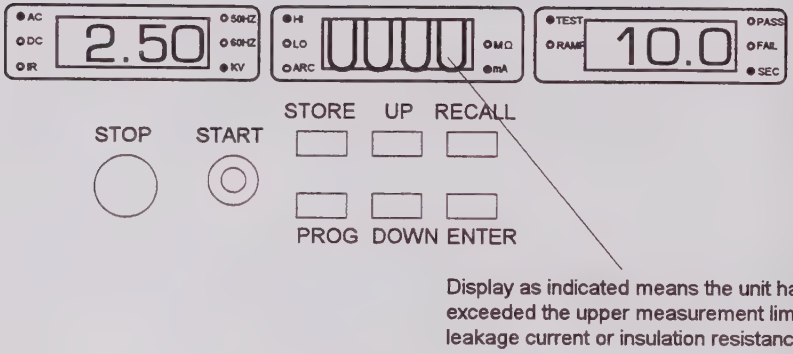
To initiate a test proceed as follows:

- Press **STOP** (red button) to place the instrument in its standby ready-to-test state.

- Press **START** (green button) to start the test. When this button is pressed the high voltage is turned on. This is indicated by the DANGER light being on to warn the operator that high voltage is present at the test leads. The voltage display will indicate the voltage value, the measure display will show current leakage value and the timer will show a countdown.

- Depending on the test conditions, the test voltage will cut off if a limit is exceeded or cut off when the test time has expired. In the case of a FAIL situation the **STOP** button must be pressed to stop the buzzer.

- The **STOP** button can be pressed at any time to stop the test.



To recall one of the ten setups proceed as follows:

- Press the **RECALL** key.
- Arrow **UP** ▲ or arrow **DOWN** ▼ to the setup number desired.
- Press **ENTER** to load the stored test conditions and then initiate a test as just described.

2.5 Programming Test Mode (AC, DC or IR)

Each test can consist of one or two steps in sequence, for example, a typical two step test might be an AC hipot test followed by an IR test. Each step may be programmed for any available function (AC, DC or IR) with programmed test conditions independent from the other step.

Figure 2-3
Test Mode Status Indicators

To change the test mode proceed as follows:

- With the instrument in standby status (Stop button previously pressed and no lights blinking) press the UP ▲ key to select or examine step 1 and the DOWN ▼ key for step 2. **For a single step test, the test voltage for step 2 must be set to 0.00, setting the test voltage for step 1 to 0.00 will inhibit all testing.** To change a test mode select the step to be changed (1 or 2) as described above and press **PROG** (the AC/DC /IR light will be blinking).
- Arrow **UP** ▲ or **DOWN** ▼ to the newly desired test mode (AC, DC or IR) and press **PROG** again.
- Once the desired test mode has been selected refer to paragraph 2.6 for changes to Hipot test conditions and paragraph 2.7 for changes to IR test conditions.

Example of test mode change:

With no light blinking if **UP** ▲ key selects AC and **DOWN** ▼ key selects DC this means that an AC Hipot and then DC Hipot test would be performed in sequence (providing neither test voltage is set to 0.00)

Let's assume it's desirable to change the DC Hipot test to an IR test so that an AC hipot and IR test are performed sequence. With no light blinking arrow **DOWN** ▼ to DC, press **PROG**, arrow **DOWN** ▼ to IR and press **PROG** again.

2.6 Programming Hipot Test Parameters

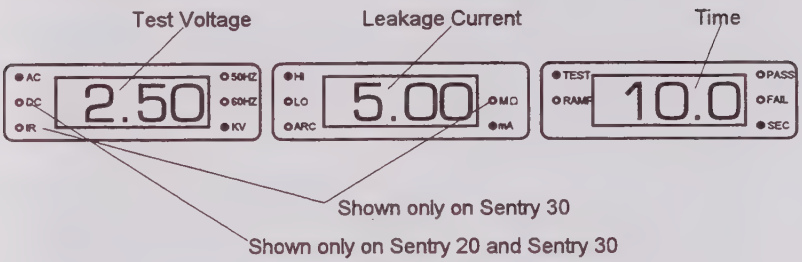


Figure 2-4
Hipot Test Parameters

With the instrument in standby status (Stop button previously pressed and no lights blinking) press the **UP** ▲ key or **DOWN** ▼ key to select the test step to be programmed. (UP arrow is step #1 and DOWN arrow step #2). If the selection is an AC or DC hipot test proceed as described below, if selection is an IR test refer to paragraph 2.7.

Press **PROG** key to begin the parameter change. The AC or DC indicator will blink depending on which was previously programmed for the step selected. Press the **ENTER** key to change the test voltage.

Test Voltage
Press the **UP** ▲ key or **DOWN** ▼ key until the desired value is shown on the display and then press **ENTER.** (0.1 to 5KV AC and 0.1 to 6KV DC are the allowable ranges)

50 or 60 Hz (AC Hipot Test only)
Press the **UP** ▲ key or **DOWN** ▼ key for 50Hz or 60Hz and then press **ENTER**.

Hi Limit
Press the **UP** ▲ key or **DOWN** ▼ key until the desired value in mA is shown on the display and then press **ENTER.** (0.001 to 15.00mA AC, or 7.5mA DC is the allowable range). Any measured value of leakage current above this will result in a fail decision.

Lo Limit

Press the **UP** ▲ key or **DOWN** ▼ key until the desired value in mA is shown on the display and then press **ENTER**. (0.001 to the Hi Limit is the allowable range). Any measured value of leakage current below this will result in a fail decision. **DOWN** ▼ to a display of [- - - -] disables the limit detection.

Check Lo (DC Hipot Mode only)

Press the **UP** ▲ key or **DOWN** ▼ key until the desired value in mA is shown on the display and then press **ENTER**. (0.001 to 7.5mA is the allowable range). **DOWN** ▼ to a display of [- - - -] disables the limit detection.

If the leakage current to the device exceeds this value any time during the test, this limit will be judged as a pass, otherwise it will be judged as fail. When this limit is judged to be a pass, all other limits (low and/or high) must also be a pass for the overall test result to indicate PASS.

This feature checks for in-rush current when the voltage is initially applied, common when testing capacitive type devices. In this case, a judgment of leakage current is based on that which occurs at any time during the test rather than at the end of the test.

Arc

Press the **UP** ▲ key or **DOWN** ▼ key until the desired value in mA is shown on the display and then press **ENTER**. (0.001 to 15.00mA is the allowable range). Any measured value of arc current above this will result in a fail decision. **DOWN** ▼ to a display of [- - - -] disables the limit detection.

Test Time

Press the **UP** ▲ key or **DOWN** ▼ key until the desired value in seconds is shown on the display and then press **ENTER**. (0.1 to 999 is the allowable range). **DOWN** ▼ to a display of [- - - -] sets the test time to continuous mode.

WARNING

EXTREME CAUTION MUST BE USED BY THE OPERATOR, IN CONTINUOUS MODE, HIGH VOLTAGE IS APPLIED TO THE TEST TERMINALS UNTIL THE STOP BUTTON IS DEPRESSED OR A LEAKAGE CURRENT BREAKDOWN OCCURS.

Ramp Time

Press the **UP** ▲ key or **DOWN** ▼ key until the desired value in seconds is shown on the display and then press **ENTER**. (0.1 to 99.9 is the allowable range). **DOWN** ▼ to a display of **[- - - -]** sets the ramp time to zero.

After the final test condition entry the instrument returns to the blinking test mode (AC or DC). Press **PROG** key to return to standby status in preparation for testing.

OR

If test conditions are to be changed in the second step press the **UP** ▲ key or **DOWN** ▼ key to select the other step:

- if a hipot test, set the test conditions as described in this paragraph.
- if an insulation resistance test, refer to paragraph 2.7 for setting test conditions.

To store the present set of test conditions proceed as follows:

- Press the **STORE** key.
- Arrow **UP** ▲ or arrow **DOWN** ▼ to the setup number desired.
- Press **ENTER** to store the present test conditions.

2.7 Programming Insulation Resistance Test Parameters (Sentry 30 only)

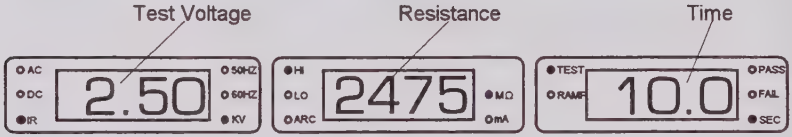


Figure 2-5
IR Test Parameters

With the instrument in standby status (Stop button previously pressed and no lights blinking) press the **UP** ▲ key or **DOWN** ▼ key to select the test step to be programmed. (UP arrow is step #1 and DOWN arrow step #2, AC, DC or IR). If the selection is an IR test proceed as described below, if selection is an AC or DC hipot test refer to paragraph 2.6.

Press **PROG** key to begin the parameter change. The IR indicator should be blinking for the step selected. Press the **ENTER** key to change the test voltage.

Test Voltage
Press the **UP** ▲ key or **DOWN** ▼ key until the desired value is shown on the display and then press **ENTER.** (0.05 to 1.00KV DC is the allowable range)

Lo Limit
Press the **UP** ▲ key or **DOWN** ▼ key until the desired value in MΩ is shown on the display and then press **ENTER.** (1 to 9999MΩ is the allowable range). Any measured resistance value below this will result in a fail decision.

Hi Limit
Press the **UP** ▲ key or **DOWN** ▼ key until the desired value in MΩ is shown on the display and then press **ENTER**. (a value above the Lo Limit to 9999MΩ is the allowable range). Any measured resistance value above this will result in a fail decision. **DOWN** ▼ to a display of **[- - - -]** disables the limit detection.

Test Time

Press the **UP** ▲ key or **DOWN** ▼ key until the desired value in seconds is shown on the display and then press **ENTER**. (0.1 to 999 is the allowable range). **DOWN** ▼ to a display of [- - - -] sets the test time to continuous mode.

WARNING

EXTREME CAUTION MUST BE USED BY THE OPERATOR, IN CONTINUOUS MODE, HIGH VOLTAGE IS APPLIED TO THE TEST TERMINALS UNTIL THE STOP BUTTON IS DEPRESSED OR A INSULATION RESISTANCE LIMIT EXCEEDED.

Ramp Time

Press the **UP** ▲ key or **DOWN** ▼ key until the desired value in seconds is shown on the display and then press **ENTER**. (0.1 to 99.9 is the allowable range). **DOWN** ▼ to a display of [- - - -] sets the test time to zero.

After the final test condition entry the instrument returns to the blinking test mode (IR). Press PROG key to return to standby status in preparation for testing.

OR

If test conditions are to be changed in the second step press the **UP** ▲ key or **DOWN** ▼ key to select the second step:

- if an insulation resistance test set the test conditions as described in this paragraph.
- if a hipot test refer to paragraph 2.6 for setting test conditions.

To store the present set of test conditions proceed as follows:

- Press the **STORE** key.
- Arrow **UP** ▲ or arrow **DOWN** ▼ to the setup number desired.
- Press **ENTER** to store the present test conditions.

2.8 Special Function Key Lock

In the key lock mode the program function (ability to change test conditions) of the instrument is disabled. It is however possible to recall any of the 10 setups and test. To activate or deactivate the key lock function proceed as follows:

- Instrument power should be off
- Press both the **POWER** and **STOP** switch at the same time and hold until the display indicates KEY LOCK, On or OFF. Arrow **UP** or **DOWN** to select the desired state and press **ENTER**.

2.9 Software Version Display

The version of software, installed in the instrument, can be displayed on the front panel.

To display software version:

- Press the front panel POWER switch to **ON** and **immediately** press the **ENTER** key. The year will be shown in the left display and the month and day in the right display as illustrated below. This software version display is only held for a couple of seconds.

2.10 Clear Setup Memory

All stored test conditions in instrument memory (10 setups) can be cleared with a few key strokes.

To clear setup memory:

- With the instrument in standby status (Stop button previously pressed and no lights blinking) press the **ENTER** key three times and then the **UP** ▲ key.

2.11 Continuity Check

When activated the Sentry provides an automatic continuity check preceding the Hipot or IR tests. The continuity check verifies the resistance to be less than 1 ohm between the rear panel continuity check connection and instrument ground. When the continuity function is turned on the Sentry will proceed into the normal Hipot or IR test only if the continuity check is good (pass condition).

Proceed as follows for continuity check on or off:

- With the instrument in the power-up state, Press **ENTER** key twice.
- Press **DOWN** ▼ key once, display should read **CONt** and **OFF** (unless continuity is already selected for on).
- Press **UP** ▲ or **DOWN** ▼ key to display **ON**.
- The continuity check will remain on until turned off by pressing the **ENTER** key twice, the **DOWN** ▼ key once and the UP ▲ or **DOWN** ▼ key to **OFF.** If the instrument is powered down with the continuity check on it remains in effect when the unit is again powered up. Continuity is not stored as part of test setups.

2.12 Fail Continuous Mode

When activated the Sentry provides a continuous test mode where the test voltage does not shut down on a fail condition.

WARNING

THIS MODE IS NOT RECOMMENDED AS A NORMAL OPERATING MODE. (On the remote control connector, one FAIL contact must be connected to START and the other FAIL contact connected to COM)

Proceed as follows for fail continuous mode on or off:

- With the instrument in the power-up state, Press **ENTER** key three times.

- Press **DOWN** ▼ key once, display should read **FAIL Cont** and **OFF** (unless already selected for on).

- Press **UP** ▲ or **DOWN** ▼ key to display **ON**.

- To exit the fail continuous setup mode press **ENTER** two times (exits through the Beep On/Off setup mode)

- The fail continuous mode will remain on until turned off by pressing the **ENTER** key three times, the **DOWN** ▼ key once and the UP ▲ or **DOWN** ▼ key to **OFF.** If the instrument is powered down with fail continuous on it remains in effect when the unit is again powered up. Fail continuous mode is not stored as part of test setups.

2.13 Beeper Setup Mode

When activated the Sentry provides a beep or audible sound for pas/fail indication and also when any one of six data entry key is depressed.

Proceed as follows for beeper on or off:

- With the instrument in the power-up state, Press **ENTER** key three times.

- Press **DOWN** ▼ key once, display should read **FAIL Cont** and **On** or **OFF.** Press **ENTER** key once again and display should read **bEEp** and **Off** (unless beep is already selected for On).

- Press **UP** ▲ or **DOWN** ▼ key to display **ON**.

- To exit the beep setup mode press **ENTER**.

- The beeper will remain on until turned off by pressing the **ENTER** key three times, the **DOWN** ▼ key once, the **ENTER** key and then the UP ▲ or **DOWN** ▼ key to **OFF.** If the instrument is powered down with beeper on it remains in effect when the unit is again powered up. The beeper setup is not stored as part of test setups.

2.14 Auto Range Mode

May not be available on all units

When Auto Range selection is turned on the full scale current range (above or below 3mA) is selected automatically based on measured current. When the selection is turned off the full scale current range is determined by the user programmed maximum current limit. The low current range (3mA full scale) results in increased measurement resolution.

Proceed as follows for auto range mode on or off:

- With the instrument in the power-up state, Press **ENTER** key three times.
- Press **DOWN** ▼ key once, display should read **FAIL Cont** and **OFF** or **ON.**
- Press ENTER key two times, display should read **Auto CHAN** and **OFF** or **ON.**
- Press **UP** ▲ or **DOWN** ▼ key to display **OFF** or **ON**, as desired.
- To exit the auto range mode press **ENTER** key.
- The auto range mode will remain in its set state until changed by pressing the **ENTER** key three times, the **DOWN** ▼ key once, the **ENTER** key two times and the UP ▲ or **DOWN** ▼ key to **OFF** or **ON.** If the instrument is powered down with auto range on it remains in effect when the unit is again powered up. Auto range mode is not stored as part of test setups.

2.15 Remote Control

Two remote control connectors are located on the rear panel of the instrument with input connections for starting and stopping the unit externally and output connections indicating instrument status and a safety interlock connection.

Inputs require a contact closure and outputs provide a contact closure, as shown in the figure below.

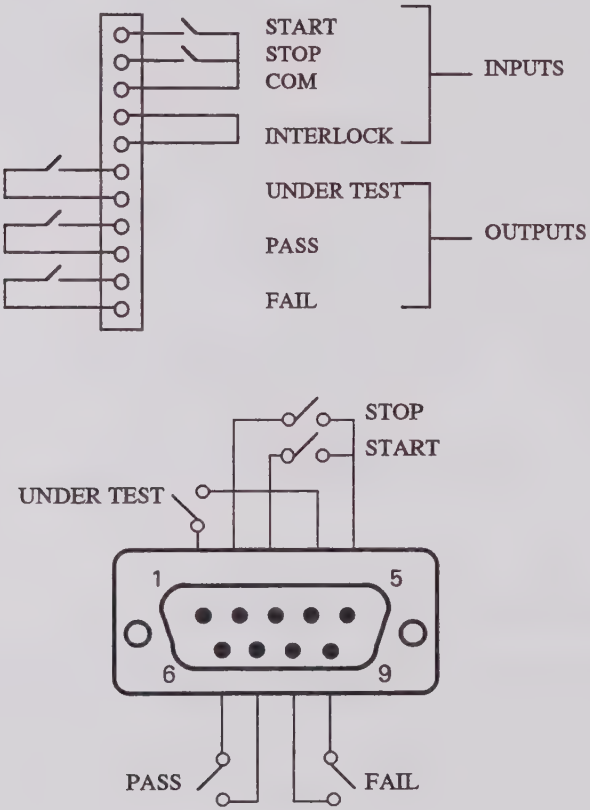


Figure 2-6
Rear Panel Remote Connectors

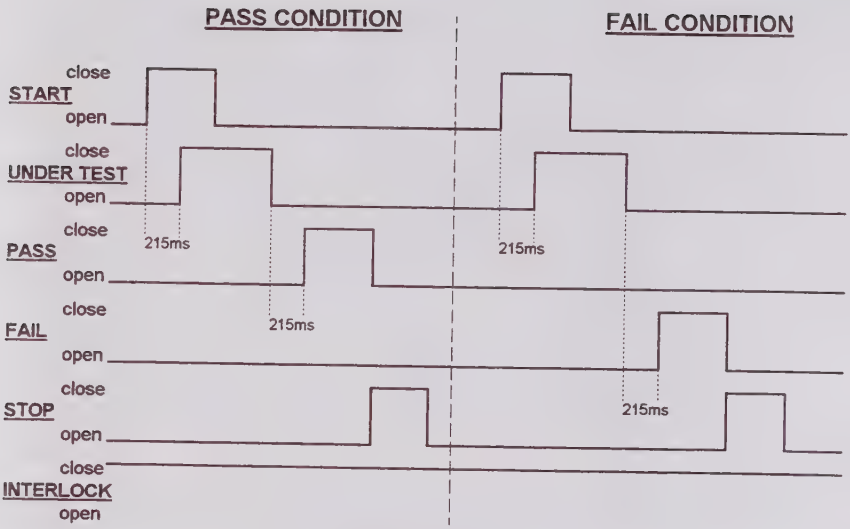


Figure 2-7
Remote Control

2.16 G16 International Power Strip

The G16 International Power Strip allows connection of standard corded products from several different countries. These being:

Switzerland
Italy
Continental Europe
United States
Denmark
United Kingdom
Australia

Refer to Figure 2-8 for connection of the G16 International Power Strip to the Sentry.

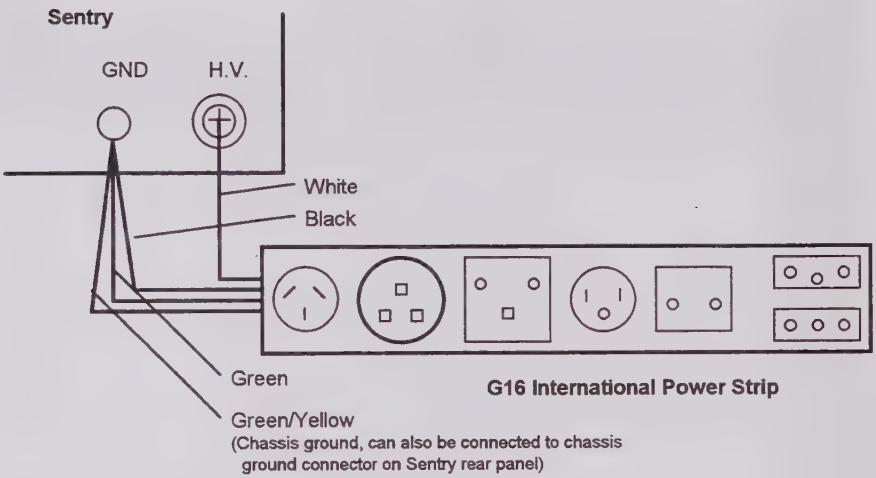


Figure 2-8
G16 International Power Strip Connection

Section 3 Service & Maintenance

3.1 General

Our warranty (at the front of the manual) attests the quality of materials and workmanship in our products. If malfunction should be suspected, or other information be desired, applications engineers are available for technical assistance. Application assistance is available in the U.S. by calling 508-485-3500 and asking for Applications Support. For support outside of the United States please contact your local QuadTech Distributor.

3.2 Instrument Return

Before returning an instrument to QuadTech for service please call our Service Department at 800-253-1230 for return material authorization. It will be necessary to include a Purchase Order Number to insure expedient processing, although units found to be in warranty will be repaired at no-charge. For any questions on repair costs or shipment instructions please contact our Service Department at the above number. To safeguard an instrument during storage and shipping please use packaging that is adequate to protect it from damage, i.e., equivalent to the original packaging and mark the box "Delicate Electronic Instrument". Return material should be sent freight prepaid, to:

QuadTech, Inc.
100 Nickerson Road
Marlborough, MA 01752

Attention: Service Department

Shipments sent collect can not be accepted.

Table 3-1
Equipment for Calibration

Description	Requirements
AC/DC Voltmeter	Measure range, 0 to 4kV, 0.1%.
AC/DC Current Meter	Measure range, 0.1 to 10 ma, 0.15%.
12 MΩ Resistance Std	Accuracy of 0.15%, 1200 V, 0.1 mA (0.12 W)
80 kΩ Resistance Std	Accuracy of 0.15%, 1200 V, 15 mA (20 W)
240 kΩ Resistance Std	Accuracy of 0.15%, 1200 V, 5 mA (6 W)
480 kΩ Resistance Std	Accuracy of 0.15%, 1200 V, 3 mA (4 W)

Procedure

1. Using a pen point or small screwdriver, depress the **[CAL ENABLE]** switch on the front panel. (Note, this is a push-push switch. To disable CAL, merely push the switch a second time).

2. Press **[ENTER]** four times.

3. Press **[DOWN]** until display reads "CAL TEST". Note [DOWN] can be continuously cycled between "CAL OFF", "CAL ON", and "CAL TEST".

4. Press **[PROG]** to select test.

5. Unit will display "0.05 OFSt ACU". This is one of 10 parameters which must be calibrated:

1. AC offset voltage.
2. AC full scale (4kV).
3. DC offset voltage.
4. DC full scale (4kV).
5. IR offset voltage.
6. IR full scale (1 kV).
7. AC offset current (0.1 ma).
8. AC full scale current (2.5 ma).
9. AC offset current (2.5 ma).
10. AC full scale current (12 ma).
11. DC offset current (0.1 ma).
12. DC full scale current (2.5 ma).
13. DC offset current (2.5 ma).
14. DC full scale current (5 ma).

While proceeding through the ten steps, the right hand display will indicate which parameter is being calibrated.

6. Starting with AC offset voltage, connect voltmeter to red and black HV leads and set range to read approximately 50-100 volts AC. Press **[ENTER] [START].**

7. Voltmeter should read AC offset voltage. Use the **[UP/DOWN]** arrow keys to adjust the center display reading to agree with the voltmeter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

8. Press **[DOWN]** to go to AC full scale. Unit will display "4.00 FULL ACU". Set voltmeter to 4kvolt AC range. Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the center display reading to agree with the voltmeter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

Steps 9 and 10, Sentry 20 & 30 only

9. Press **[DOWN]** to go to DC offset. Unit will display "0.05 OFSt dCU". Set voltmeter to 50-100 volt DC range. Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the center display reading to agree with the voltmeter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

10. Press **[DOWN]** to go to DC full scale. Unit will display "4.00 FULL dCU". Set voltmeter to 4kvolt DC range. Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the center display reading to agree with the voltmeter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

Steps 11 and 12, Sentry 30 only

11. Press **[DOWN]** to go to IR offset. Unit will display "0.05 OFSt irU". Set voltmeter to 50-100 volt DC range. Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the center display reading to agree with the voltmeter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

12. Press **[DOWN]** to go to IR full scale. Unit will display "1.00 FULL irU". Set voltmeter to 1000 volt DC range. Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the center display reading to agree with the voltmeter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

13. Remove voltmeter. Connect current meter set to read 0.1 ma AC in series with 12 MΩ standard and Sentry output.

14. Press **[DOWN]** to go to AC offset current. Unit will display "OFSt 0.120 ACA". Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the left display reading to agree with the current meter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

15. Press **[DOWN]** to go to AC full scale current. Unit will display "FULL 2.500 ACA". Set current meter to 10 mA AC range and change the standard to the 480kΩ resistor. Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the left display reading to agree with the current meter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

16. Press **[DOWN]** to go to AC offset current. Unit will display "OFSt 2.500 ACA". Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the left display reading to agree with the current meter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

17. Press **[DOWN]** to go to AC full scale current. Unit will display "FULL 12.00 ACA". Set current meter to 20 mA AC range and change the standard to the 80kΩ resistor (must be greater than 80kΩ to ensure current is less than 15.00 mA at 1.2 KV). Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the left display reading to agree with the current meter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

Steps 18 through 21, Sentry 20 & 30 only

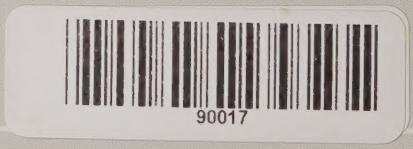
18. Press **[DOWN]** to go to DC offset current. Unit will display "OFSt 0.120 dCA". Set current meter to 0.1 mA DC range and change the standard to the 12 MΩ resistor. Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the left display reading to agree with the current meter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

19. Press **[DOWN]** to go to DC full scale current. Unit will display "FULL 2.500 dCA". Set current meter to 5 mA DC range and change the standard to the 480kΩ resistor. Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the left display reading to agree with the current meter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

20. Press **[DOWN]** to go to DC offset current. Unit will display "OFSt 2.500 dCA". Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the left display reading to agree with the current meter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

21. Press **[DOWN]** to go to DC full scale current. Unit will display "FULL 5.00 dCA". Set current meter to 10 mA DC range and change the standard to the 240kΩ resistor. Press **[ENTER] [START].** Use the **[UP/DOWN]** arrow keys to adjust the left display reading to agree with the current meter (within available resolution). Press **[ENTER] [STOP]** to accept reading.

22. This concludes the adjustments. Press the **[PROGRAM]** switch, press **[ENTER]** four times, and then **[DOWN]** until "CAL ON". is displayed. Press **[ENTER]**. Push the "**CAL ENABLE**" switch with a pen tip or small screwdriver to disable calibration.



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